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Mr. Donald H. Gips, Chief International Bureau Federal Communications Commission 2000 M Street, NW, Suite 830 Washington, D.C. 20554 EX PARTE OR LATE FILED

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Mr. Richard Smith, Chief Office of Engineering and Technology Federal Communications Commission 2000 M Street, NW, Suite 480 Washington, D.C. 20554

TECETAL COMMUNICATIONS COMMISSION OFFICE OF CERTARY

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William Kennard, Esq. General Counsel Federal Communications Commission 1919 M Street, NW, Room 614 Washington, D.C. 20554

Re: CD Radio Request for Pioneer's Preference, PP-24

Dear Messrs Gips, Smith and Kennard:

Satellite CD Radio, Inc. ("CD Radio") hereby submits this letter and attachments for the review panel in response to the Commission's Public Notice, DA 96-1650, released September 30, 1996.

I. Introduction

The United States Court of Appeals for the District of Columbia Circuit has noted that "[t]he Commission adopted its pioneer's preference rules in order to encourage and reward the development of new and innovative communications services." *Mobile Communications Corp. of America v. FCC*, 77 F.3d 1399, 1408 (D.C. Cir. 1996). CD Radio is the ideal candidate for such encouragement and the reward of a license. CD Radio is a small, entrepreneurial company. At tremendous expense, it developed a technically innovative system with immense promise of

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consumer benefit and spearheaded the regulatory effort to find and clear spectrum and develop service rules. Those efforts deserve a pioneer's preference, as demonstrated in the extensive record already developed.

The Review Panel's task as set forth by the FCC is to review the technical component of CD Radio's pioneer's preference application and those of two other applicants. By its letter dated August 30, 1996 the FCC directed the review panel to make "joint written recommendations to the Commission for each of the three requests, explaining why the panel believes each request should or should not be granted." The panel was asked to apply only the first two of the three relevant criteria to the evaluation of applications for a pioneer's preference. As summarized in the FCC's letter, those criteria require that an applicant for a pioneer's preference demonstrate:

- 1. "that it (or its predecessor in interest) has developed the capabilities or possibilities" of a new service or technology "or has brought them to a more advanced or effective state", 47 C.F. R. Sec. 1.402(a), and
- 2. "the technical feasibility of its proposal, by summarizing its experimental results in its preference application, unless it instead submits an acceptable showing of technical feasibility", 47 C.F.R. Sec. 1.402 (a).

CD Radio submits this letter in an effort to summarize and clarify for the Review Panel how the record evidence demonstrates that CD Radio's application for a pioneer's preference complies with the two above criteria. We recognize that the review period is limited and the Review Panel must now consider last-minute submissions. Therefore, we will demonstrate that the technical merit of CD Radio's application for a pioneer's preference is overwhelming and that the objections raised against it by others are erroneous. Second, we will discuss the pertinence of the evidence and analysis recently submitted to the Review Panel, and show that the vast majority of recent submissions are irrelevant to the panel's technical mandate.

II. CD Radio's Application Overwhelmingly Meets The Relevant Technical Criteria

As the documents previously submitted to the Review Panel demonstrate, the technical merits of CD Radio's application are compelling. CD Radio's claim to a preference is not solely

based on any single element of technical innovation that it has accomplished. Besides being the first to propose the allocation of spectrum to a new satellite DARS service; applying for an FCC license; assisting in finding, clearing, and obtaining international recognition of the spectrum allocation, CD Radio's technical "firsts" include conceptualizing and designing a satellite spatial diversity system to mitigate the effect of blockage and multipath; constructing a test system to confirm its design; and designing and fabricating an S-band antenna and automobile radio to receive the signals. These efforts show that CD Radio has exhibited the overall characteristics of a pioneer, including substantial innovation and complete system design and ample testing and demonstration as required by the preference criteria.

Various last minute objections by Digital Satellite Broadcasting Corporation (DSBC) (dated September 13, 1996) only serve to underscore the strength of CD Radio's case for a preference. The attached statements by Robert Briskman, CD Radio's chief technical officer, and Wilbur Pritchard, an acknowledged expert in communications satellite system design, demonstrate that not only are these latest round of objections without any technical merit, but that CD Radio's technical achievements are substantial.

A. Technical Achievement

1. Spatial Diversity

CD Radio's unquestioned technical claim to have innovated satellite spatial diversity to mitigate transmission outages from both multipath and blockage in a satellite DARS system is not diminished by DSBC's notation of that a different technology is used in fixed services (spatial diversity in terrestrial fixed microwave) or that a different technology is used in the satellite services (triangulation of signals for position determination). In any case, CD Radio has received patents for its technology in the U.S. and other countries. Patents are granted only to those innovations that are demonstrated to be "new and useful" (35 U.S.C. § 101) and which would not "have been obvious at the time the invention was made to a person having ordinary skill in the art." (35 U.S.C. § 103). In practice, this means that CD Radio's inventions represent an advancement over the "prior art," such as that cited by DSBC, as judged by an independent technical evaluator (i.e., the U.S. Patent and Trademark Office).

2. S-Band Equipment

CD Radio was the first entity to build an S-band satellite antenna capable of receiving high-quality digital audio signals in a mobile environment and an S-band automotive radio capable of

converting those signals to multichannel CD-quality audio programming. CD Radio also holds a U.S. patent on its antenna as used in its satellite radio system, indicating that it too represented an advance over the prior art. Moreover, CD Radio's automotive radio required extensive technical efforts, exclusively performed by CD Radio, to tie CD Radio's microprocessor with existing radio components, to add a third receiving band, and to incorporate a larger display (to convey the new programmatic information). CD Radio's receiver was depicted and pictured in its various preference filings. Contrary to DSBC's contention, the fact that this radio used some off-the-shelf components and subsystems (e.g., the Ford radio on which it was based) simply demonstrates logical development efforts that were directed toward the fabrication of millions of such radios for the commercial marketplace.

3. Technical Demonstration

CD Radio conducted an S-band automotive experimental/ demonstration system at power levels equal to those that normally would be received from a satellite. These successful tests, heard by dozens of people -- including one current FCC Commissioner -- operated at power levels comparable to those levels that would have been received from a satellite. This was confirmed by an independent engineer, whose certification is attached. Tests, including those that DSBC cites, were indeed performed at higher power levels, but these were done to calculate the precise amount of multipath fading mitigation achieved by spatial diversity. These tests were operated at higher power for this purpose alone.

B. Alleged System Changes

1. Change to CDM Modulation

CD Radio has long explored various different modulation techniques for use in its satellite radio design. For example, its September 15, 1995 comments on the Docket 95-91 NPRM discussed TDM, CDM and FDM. Similarly, CD Radio's spatial diversity patent covers systems with all three modulation types as well. While CD Radio hopes to use TDM, it appears that sufficient spectrum may not be available to provide the high-quality audio signals, and channel capacity, that the service requires. Therefore, in order to accommodate a new possible FCC band plan, CD Radio would intend to use CDM. Contrary to DSBC's claim, however, this in no way would invalidate CD Radio's preference request. The appropriate modulation technique will be chosen after the FCC adopts a satellite DARS frequency band plan and associated technical rules. The claims to the preference do not rely on any particular modulation technique; indeed, both CDM and TDM are well understood and used throughout the industry and could not now form the basis of

any preference award. Instead, the core of CD Radio's preference request is a system that mitigates the effects of blockage and multipath, which could be done with either modulation technique. This situation is analogous to that of Mtel, which was awarded a preference for its PCS system. Mtel developed a "Multi-Carrier Modulation (MCM)" technology that could be implemented in various specific ways, such as "MOOK" and "PSFK." The Commission did not base its award on use of either of these techniques, but on Mtel's broader development and application of MCM technology in a simulcast environment. This award was upheld by the Court of Appeals. See Mobile Communications Corp. of America v. FCC, 77 F.3d at 1408.

2. Terrestrial Gap Fillers

Although the admitted fact that CD Radio was the first to make a proposal that included terrestrial gap fillers may be relevant to the third preference criterion, CD Radio makes no claims that any of its plans for terrestrial gap fillers relate to its technical qualification for a preference. As a result, the issue is irrelevant to the technical panel and this alone disposes of DSBC's contention. Beyond this, however, CD Radio always planned a limited number of terrestrial stations, to be located in a few core urban areas and tunnels. The root of CD Radio's dispute with DSBC regarding terrestrial stations was DSBC's proposal to implement scores of such stations -- its application proposed spending \$88 million on terrestrial stations. CD Radio's negative comments on terrestrial transmitters were made in this context; CD Radio has held a consistent position on the subject since its original filing.

Other issues raised by DSBC are fully discussed in the Briskman statement.

III. The Review Panel's Mandate Is To Evaluate the Technical Merit of the Satellite DARS Pioneer's Preference Applications

Focusing on the technical criteria set forth above makes clear that most of the documents filed in the satellite DARS service rulemaking and related proceedings, concerning issues such as the potential impact of satellite DARS on existing broadcasters or public interest obligations of satellite DARS licensees and a raft of other similar issues, are simply not germane to the Panel's technical task as defined by the FCC. Indeed, it is CD Radio's strong belief that the FCC has

already forwarded to the Review Panel sufficient relevant documents to conduct a rigorous evaluation of the preference requests.

Documents heretofore in the record but only now submitted to the Review Panel should be subject to this relevancy test and, if not related to the panel's mandate, should not affect the panel's recommendation on technical issues. This is clearly the case with the recent submissions by Primosphere Limited Partnership (Primosphere) (dated September 17, 1996) and American Mobile Radio Corporation (AMRC) (dated September 18, 1996). Primosphere's submission references documents that primarily assert contentions regarding alien ownership of CD Radio. They also briefly raise international allocation and service rule issues. AMRC's letter and attached document make claims regarding the history of the allocation of the S-band to satellite-based DARS. We briefly discuss these below:

Alien ownership issues: These issues have nothing whatsoever to do with the technical mandate of the review panel. Moreover, the ownership data in Primosphere's pleadings is out of date. In any case, CD Radio's alien ownership is below 25%.

International allocation issues: Primosphere's contention that providing service on a non-broadcasting basis is inconsistent with international radio regulations is an issue for the FCC to decide when it promulgates service rules. It is clearly irrelevant to the review panel's two technical criteria. Primosphere's contention also is incorrect. Terms of art of the ITU allocations -- such as "broadcast satellite" -- in no way impair the Commission's ability to regulate the domestic provision of the service consistently with the public interest. Indeed, as the Commission is well aware, video DBS -- also operating in spectrum allocated by the ITU for the broadcast satellite service -- may be licensed by the FCC as a common carrier or private carrier service.

Service rule issues: Primosphere's contention that CD Radio's application for a license should not be considered until a service rulemaking is concluded is completely unrelated to the Review Panel's criteria for evaluating a pioneer's preference. It is also inconsistent with the Commission's pioneer's preference rules and policies.

S-band allocation issue: AMRC's contention that its corporate parent (AMSC) first suggested that satellite DARS could be located in the S-band is not germane to the two technical criteria of the Review Panel. Even if it were, AMRC is simply wrong. AMSC, seeking more spectrum for its L-Band mobile satellite system, sought to oppose CD Radio's earlier L-Band satellite DARS application by moving the frequency somewhere else,

including the eventual home of satellite DARS at 2310-2360 MHz. AMSC did nothing more. As detailed in the attached statement of Robert Briskman, CD Radio conducted S-band feasibility studies, met with the then-current users of the band, and assisted the government at WARC-92 in getting the U.S. S-band allocations for DARS. CD Radio appropriately claims to be a pioneer in part for this effort.

In sum, the same two technical criteria that demonstrate CD Radio's qualification as a pioneer should also "filter" any new analyses or documents submitted to the Review Panel. CD Radio believes that focusing on the Review Panel's technical criteria will greatly facilitate the panel's task and mitigate any unnecessary delay, especially if voluminous documents are now submitted to the Review Panel.

IV. Conclusion

As the Review Panel completes its evaluation of the three satellite DARS applications for pioneer's preference, CD Radio would like to stress the importance of the Review Panel's decision in this overall process. Over the last six years CD Radio has developed and demonstrated its new technical system, proceeding under FCC rules that were designed to encourage companies to undertake such efforts to bring new services to the American people.

The pioneer's preference concept was developed to assist innovators, particularly small entrepreneurial companies, in complying with FCC regulatory process: "[T]he governmental process thus undermines the competitive edge that would normally accrue to the innovator." Pioneer's Preference Notice, 5 FCC Rcd 2766, 2766 (1990). Absent a preference, a small entity might not be able to seek the necessary regulatory changes to implement a new radio service that is of value to the American public. A preference thus was designed to "provide innovators and financial institutions with sufficient certainty," and "ensure that innovators have an opportunity to participate. . in the new services that they take a lead in developing." Pioneer's Preference Order, 6 FCC Rcd 3488, 3488, 3494 (1991).

CD Radio is that innovator. As Mr. Briskman's statement makes clear, CD Radio has earned several important patents substantiating the significant innovation achieved by CD Radio. (The FCC is permitted to take "official notice" of these patents as government records whose factual accuracy is not in doubt and has already forwarded them to Review Panel.) CD Radio also

expended considerable effort in other important areas to develop and demonstrate a complete technical system. Over this period, CD Radio spent more than \$17 million as reported in SEC filings and expended countless hours pursuing all aspects of the regulatory and business process, in addition to developing and refining its technical achievements. Over two years ago, CD Radio, whose sole business is the development of satellite DARS, became a public company and now has over 2,500 shareholders.

In contrast, the other competing applicants make little demonstration of their own efforts, technical or otherwise. It is noteworthy that their recent submissions merely emphasize opposition to CD Radio's pioneering efforts. The competing applicants did not even file formal oppositions to CD Radio's application for a pioneer's preference during the allotted periods as provided by FCC rule. Nor did they apparently follow the public record in this proceeding, but chose to "sit on their procedural rights." In May of this year, the FCC Commissioners were reported to have agreed to award a pioneer's preference to CD Radio. Now, CD Radio believes that the analysis of a Review Panel comprised of career government engineers with long experience in the satellite field will be decisive, and will move this prolonged process to a final conclusion.

CD Radio respectfully submits to the Review Panel that the overwhelming case for granting its application for a pioneer's preference has long been widely recognized -- including inside the FCC, as reported by the press. Apart from some generic objections that have been raised to the pioneer's preference policy itself, opposition comes only at the last minute from competing applicants. It has now fallen to the Review Panel to conduct a rigorous, expeditious technical evaluation of the three applications before it under the existing rules and thereby to assure a just

result is achieved. CD Radio is confident that the Review Panel will rigorously and justly carry out the mandate the Commission has given it and that — after six years and mammoth efforts to develop and demonstrate a satellite DARS system — CD Radio will be able to move ahead in its endeavor to bring this important new service to the American people.

Respectfully submitted,

Richard E. Wiley

Counsel for CD Radio Inc.

Peter K. Pitsch

Pitsch Communications

Attachments

cc: John Stern, IB (5 copies)
Rosalee Chiara, IB
Ronald Repasi, IB
Rodney Small, OET
Peter Tenhula, OGC
Daniel Phythyon, OLIA
All parties to PP-24

STATEMENT OF ROBERT D. BRISKMAN

This Statement responds to the Digital Satellite Broadcasting Corporation (DSBC) submission of September 13, 1996 which contains technical allegations that Satellite CD Radio, Inc. (CD Radio) does not deserve a Pioneer's Preference. In total, DSBC raises nine issues. All of its allegations are erroneous or not relevant.

1. Satellite spatial diversity. CD Radio's preference application asserts that it has conceived satellite spatial diversity (as well as accomplishing its development, test and demonstration) for the mitigation of transmission outages from both multipath and blockage in a satellite radio system. No entity has claimed otherwise. In fact, CD Radio has obtained United States patent 5,319,673, filed in early 1993, for its satellite spatial diversity techniques. Patents are only granted for original and practical innovations and only after an extensive search of prior patents and literature. Patents have also been granted by Canada 2103815, Mexico 180437 and Australia 659703 after *independent* searches by their patent offices.

DSBC notes that spatial diversity has been used in "terrestrial microwave systems." This is inapplicable to the subject satellite spatial diversity system. Receivers in terrestrial microwave systems are not mobile, resulting in totally different blockage and multipath conditions.

DSBC notes that multiple channel mobile receivers have been used in "the Navstar-GPS satellite navigation system." This is not relevant. Each of the satellite signals received by GPS receivers is processed independently to extract the independent timing information for obtaining a position determination. In contrast, in the CD Radio satellite spatial diversity system, the received signals are identical and are either combined or selected for mitigation of outages from blockage and multipath. Additionally, the GPS patent was cited as prior art by the U.S. patent examiner in CD Radio's previously noted United States patent. This means that the examiner investigated and considered the GPS patent and found that CD Radio's invention was technically different.

2. <u>Demonstration</u>. CD Radio has demonstrated the technological innovations it claims for a Pioneer's Preference in an extensive and lengthy series of tests and simulations previously reported to the Commission. DSBC dismisses these by claiming that measurement data were taken with a satellite emulator power level 17 dB (50 times) higher than CD Radio's proposed operational satellite link budget. DSBC is not correct. CD Radio's automobile S-band demonstration system operated at transmission power levels that simulated those that would be received by its proposed geostationary satellites. Several dozens of government and industry officials that took part in the demonstrations heard the results: clear, noise-free CD quality music

transmitted at S-Band in a mobile environment at these power levels. Also, CD Radio's underwriters secured the services of an independent engineer, who verified that the power levels received by the demonstration automobile were equivalent to those that would have been received from its geostationary satellite. His statement and biography are attached hereto.

DSBC is correct (see DSBC Submission of September 13, 1996, Appendix at 5) that CD Radio's testing did involve measurements made at power levels greater than its satellite normally would operate. This was done in order to measure the precise amount of multipath fading mitigation provided by satellite spatial diversity (10-15 dB, 12 dB nominal). Measurements with fading margins somewhat above 15 dB were essential so that multipath outages could be separated from blockage outages. This also permitted measurement of fading occurrences when only one of the two transmissions is impacted by multipath. For this purpose, CD Radio increased the power levels in order to measure the precise degree of the fading.

- 3. <u>CDMA</u>. CD Radio clearly documented its intent to change its modulation from TDM to CDMA if other radio frequency allocation band plans and associated technical rules are adopted. CD Radio has proposed this change solely in response to a possible new FCC frequency allocation band plan. CD Radio's preferred system design would use TDM with its originally proposed frequency plan, DSBC allegations to the contrary notwithstanding. That fact, however, does not diminish CD Radio's qualification for a preference, for four reasons:
- a. DSBC's allegations are irrelevant as CD Radio has *not* claimed that the use of TDM, a very old technology pioneered by others, was in any way a basis for CD Radio's Pioneer's Preference. CD Radio's claim for a preference is based on mitigating blockage and multipath in digital audio radio service delivered by satellites regardless of the modulation employed.
- b. CD Radio intends to use CDMA in order to optimize transmission performance within its spatial diversity scheme that mitigates multipath and blockage, assuming the FCC does adopt a 12.5 MHz bandwidth allocation with appropriate associated technical rules. Prior to that, moreover, CD Radio's FCC filings discussed a variety of possible modulation schemes. See Comments of CD Radio, Appendix B, at 10-11 (filed Sept. 15, 1995), discussing how CD Radio's satellite spatial diversity system could employ TDM, FDM or CDMA modulation. The CD Radio patents on satellite spatial diversity noted in Paragraph 1 of this Statement specifically claim the use of a wide variety of modulations including TDM, CDMA and FDM.
- c. DSBC's claim that its use of CDMA should preclude a preference for CD Radio also is beside the point. CDMA, as a modulation scheme alone, is not the basis of CD Radio's preference application. Basic CDMA technology could support no preference applications, since it has been known since the 1940s and extensively used in military and, more recently, commercial systems. CDMA also is used in various satellite systems and is covered by numerous government and industry patents. Moreover, CD Radio's intended technical use of CDMA is

substantially different from DSBC's proposed use, since CD Radio uses it for transmission isolation between its two satellites while DSBC's system of one multibeam satellite intends its use to mitigate "inter and intra-beam self interference." (DSBC Application for a Digital Audio Radio Service Satellite System, Section B, page 3 (filed Dec. 15, 1992)).

- d. DSBC's Application of Dec. 15, 1992, itself actually proposed two alternative systems, one TDM and one CDM, since the frequency band allocation and licensing rules had not been finalized by the FCC. See DSBC Application for a Digital Audio Radio Service Satellite System, Section A, page 3-4, Section B at 3-4, filed Dec. 15, 1992.
- 4. Terrestrial Gap Fillers. As correctly quoted by DSBC, CD Radio "was the first to petition the FCC (May 1990) to provide complementary satellite and terrestrial audio radio service." This undisputed first-ever service proposal to the FCC may be relevant to the third of the Pioneer Preference criteria, but that will be decided by the Commission, not the panel. CD Radio has never made any technical claims for a Pioneer's Preference concerning terrestrial repeaters, and DSBC's concerns are thus inapplicable to the review panel. Moreover, the quoted references of DSBC support that belief rather than show any change in position over time. CD Radio has consistently proposed a system that includes only a limited number of terrestrial stations, and limits those stations solely to repeating the satellite signal. Thus, in CD Radio's proposal, only a limited number of terrestrial gap fillers are needed to provide complete coverage (i.e., some long tunnels and a few core urban areas).

In particular, DSBC is wrong in alleging that the proposed CD Radio system is now like DSBC's. The proposed DSBC system included the implementation of very large numbers of terrestrial stations. (See DSBC Application, Section F, Page 1 and Appendix V, Page 2, filed December 15, 1992, calling for a "Complementary Terrestrial Network costing \$88M.") CD Radio's system originally and still envisions a number that is over an order of magnitude less. We agree with DSBC that its proposal for extensive use of terrestrial stations clearly distinguishes its system from CD Radio's satellite radio system.

5. Car Receiving Antennas. CD Radio's Pioneer's Preference application states that it developed, had manufactured, tested and demonstrated a very small antenna suitable, technically and ergonomically, for reception in passenger automobiles and elsewhere. DSBC correctly points out that the antenna design uses previously known "microstrip planar array technology" - it also uses a standard miniature microwave connector. However, this in no way diminishes CD Radio's pioneering efforts in adopting the technology for satellite radio application, designing and developing the antenna for the specific technical use and radio frequency band, having it manufactured and then tested and demonstrated in the specific satellite radio system environment to be implemented. A photograph of the antenna is attached.

Significantly, CD Radio has received United States patent 5,485,485 for the use of the subject

antenna in its satellite radio system. The Patent and Trademark Office considered the prior art, including the technology referenced by DSBC. As earlier stated, patents are granted only after originality has been established by an extensive technical review in the Patent and Trademark Office.

- 6. Frequency Allocation. We agree with DSBC, of course, that the actual satellite DARS frequency allocation at S-band was accomplished by dedicated U.S. government employees at the Conference. CD Radio's claim, as correctly noted by DSBC, is that "CD Radio worked with the U.S. government to obtain an international allocation for satellite DARS at the '92 WARC. (1993 Supplement, p.10)." CD Radio fails to understand why DSBC claims there is any difference between the "claim" and "reality" in this case. CD Radio has detailed elsewhere (see Preference Supplement at 7-8 (filed June 2, 1993)) its significant efforts in regard to obtaining the allocation. To reiterate, before any other S-Band satellite proposal was filed at the Commission on December 15, 1992, CD Radio conducted studies to show S-band could be used instead of L-band; helped NTIA and AFTRAC in locating a suitable, interference free portion of S-band for satellite radio service; assisted in negotiations between AFTRAC and the government to persuade telemetry users to abandon part of the band; and participated in the WARC '92 delegation. Perhaps most importantly, CD Radio accomplished these tasks, and amended its FCC application to propose use of S-Band, before any other satellite DARS applicant -- DSBC included -- even filed with the Commission.
- 7. Frequency Diversity. The technical design for the satellite system originally proposed by CD Radio provides complete diversity against frequency selective fading. The CDMA design CD Radio now may implement, fashioned to fit the frequency band plan which the FCC has discussed adopting, will also allow CD Radio's system to have substantial diversity against frequency selective fading as specifically noted in a previous CD Radio submission. (See CD Radio Comments, Appendix B, at 10-11, filed September 15, 1995.)
- 8. <u>Music Compression</u>. CD Radio extensively evaluated during 1992 existing music compression techniques (MUSICAM, PAC, APT and ASPEC) and chose AT&T's Perceptual Audio Coding (PAC) as being superior. CD Radio worked extensively with AT&T for over a year to obtain a PAC compression system suitable for satellite radio, to design and build a decompressor suitable for installation in a passenger automobile, to engineer all of the technical interfaces (i.e., radio, order wire control, error flagging, display, demodulator, etc.) and to demonstrate its operation in a realistic satellite radio mobile environment. DSBC notes only that an AT&T paper written in 1991 supplied by CD Radio describing the PAC algorithm and compression technique does not mention CD Radio's contributions which occurred later. CD Radio supplied the paper solely so the reader of the document would know in detail how PAC compression operates. AT&T developed the PAC algorithm and compression technique, but CD Radio's contributions in developing, testing and demonstrating this technology for satellite radio, as detailed above, are valid claims for a

Pioneer's Preference.

9. Mobile Receiver. CD Radio conceived, designed, built, tested and demonstrated the world's first mobile three-band (AM/FM/S-band) receiver for the demonstration/test automobile. DSBC notes that "no details of the CD Radio contributions were provided - only the display of the work of others." The previously submitted documents, however, clearly state the just noted contributions of CD Radio (i.e., Preference Supplement, filed June 2, 1993, Attachment A, Appendix 1, pp. 22-27, p. 36 and pp. 20-25 in Attachment A, Appendix A.3.). That radio was pictured (see attached photograph) and diagrammed in previous submissions, and several dozens of government and industry officials saw and heard the results.

DSBC intimates (DSBC Submission of September 13, 1996, Appendix at 6) that the radio was the work of others. Of course, the radio contained several subsystems purchased from others. For instance, as noted in our previous Submission, CD Radio modified the standard Ford radio in its Lincoln Mark VIII demonstration vehicle to become a three-band radio. CD Radio hardware and software experts performed exclusive and extensive technical efforts in interfacing the CD Radio microprocessor with the three microprocessors in the standard Ford radio, in adding a satellite band selector button, a larger display, a subscription control channel, music program information visual presentation, etc. The use of existing subsystems or the modification of existing subsystems (e.g., the Ford radio) reflects CD Radio's logical developmental efforts that were conceived to lead to the radio's mass manufacture by existing automobile radio manufacturers, and in no way diminishes CD Radio's innovative contributions.

I conclude that DSBC's last minute allegations with regard to CD Radio's Pioneer's Preference are self-serving and without merit.



Certification of Person Responsible for Technical Information

I hereby certify that I am the technically qualified person responsible for the preparation of the engineering information contained in the foregoing letter, including the Statement; that I am familiar with Part 25 of the Commission's rules; that I have prepared or reviewed the attached filing; and that it is complete and accurate to the best of my knowledge.

My professional and educational qualifications are fully set out in the attached resume.

Robert D. Briskman

Professional Engineer

DC License # 749008279

- Dated: October 2, 1996

Sworn and subscribed to before me this 2nd day of October, 1996

Notary Public

My Commission expires: 1-31-98



ROBERT D. BRISKMAN

Biography

Robert D. Briskman is Chief Technical Officer of CD Radio Inc. and President of its Systems Group. He has been involved with communication satellite systems since their inception. Mr. Briskman is responsible for the development, implementation and management of CD Radio's satellite broadcast distribution system. His technology development responsibility includes design of low cost satellite receiving terminals for automobiles and of direct broadcast sound programming and operational facilities.

Prior to CD Radio, Mr. Briskman was with the Geostar Corporation from 1986-1991. He was responsible at Geostar for the development, design, implementation and operation of the Radio Determination Satellite Service provided by Geostar which allows positioning and message communications between mobile users nationwide and their dispatch centers. Mr. Briskman directed the construction of Geostar's space segment, the control and operations center and the development of the mobile terminals used on land, sea and airborne vehicles built by the SONY, HUGHES Network Systems and KENWOOD Corporations. He was responsible for the development of a miniaturized handheld transceiver by Motorola which was the world's smallest satellite earth terminal. Mr. Briskman served as Senior Vice President, Engineering and Operations.

Mr. Briskman was employed by the Communications Satellite Corporation (COMSAT) in January 1964, and was responsible initially for satellite command and control activities, including those involved with the launching of INTELSAT I (Early Bird). He was later a Department Manager in the Transmission Systems Division, where he was involved with the development and implementation of the INTELSAT global communications system. Among his efforts, early work in demand assigned single carrier per channel, radio frequency interference minimization and terrestrial interconnection was accomplished. Mr. Briskman was responsible from 1967-1973 for the technical planning involved with the provision of domestic communications services via satellites, including AT&T's satellite systems.



Mr. Briskman joined COMSAT General Corporation on its founding in 1973 and was Assistant Vice President, Space and Information Systems. He was responsible for the COMSTAR satellite system, the development of earth resource and information systems, and the implementation of the first remote satellite data collection system in conjunction with the United States Geological Survey and Telesat Canada. He directed the construction of the Southbury and Santa Paula earth stations which were used for command and control of both MARISAT and COMSTAR satellites and for shore communications to the Atlantic and Pacific MARISAT satellites. Mr. Briskman joined Satellite Business Systems in mid-1977 where he was responsible for the Pre-Operational Program which provided voice and data communications services to many IBM facilities in the United States using the first demand-assigned, time division multiple access system ever placed in commercial operations.

Mr. Briskman returned to COMSAT General in 1980 where he was responsible as Vice President, Systems Implementation for the engineering of satellites, earth stations and communications technical facilities of COMSAT General and of clients, both within and external to COMSAT. His organization provided a complete range of technical services nationally and internationally, including those involved with software, spectrum engineering and teleconferencing. Mr. Briskman was responsible for the PALAPA (Indonesia's domestic satellite system), MORELOS (Mexico's domestic satellite system), ARABSAT and ITALSAT programs as well as for providing support to the INMARSAT, INTELSAT, STC (Direct broadcast), TELSTAR-3, ALASCOM, SATCOL, UNISAT, INTELMET, NORDSAT, CHINASAT AND CAMEROON programs.

Prior to COMSAT, Mr. Briskman joined the National Aeronautics and Space Administration (NASA) during its founding in 1959. At NASA, Mr. Briskman was Chief of Program Support for the Office of Tracking and Data Acquisition. He was involved with the development of ground instrumentation for such projects as APOLLO, GEMINI, RANGER, MARINER, and ECHO. Mr. Briskman received the APOLLO Achievement Award from NASA for the design and implementation of the Unified S-Band System. Before NASA, he was employed by IBM in 1954 and worked on the design of asynchronous buffer systems. After two years of military service as an Electronic Countermeasures Analyst Officer, for which he was awarded the Army Commendation Medal, Mr. Briskman was employed by the Army Security Agency. He was engaged in communications systems development and analysis.



Mr. Briskman is a Fellow and past Secretary-Treasurer, Vice President for Technical Activities and Director of the Institute of Electrical and Electronics Engineers (IEEE). He has been President of the Aerospace and Electronics Systems Society, Director of the National Telecommunications Conference, Chairman of the EASCON Board of Directors, and Chairman of the IEEE Standards Board. Mr. Briskman has authored over fifty technical papers, holds several United States and foreign patents, served on the Industry Advisory Council to NASA, and is a licensed professional engineer. He is a Fellow of the AIAA and the Washington Academy of Science, past President of the Washington Society of Engineers, and a member of IAA, AFCEA and the Old Crows. He is also a recipient of the IEEE Centennial Medal. Mr. Briskman holds a B.S.E. degree from Princeton University and a M.S.E.E. degree from the University of Maryland.

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30 September 1996

Certification of Wilbur Pritchard (One of the world's leading experts in communications satellite system design - See enclosed biography).

1. I have participated in prior FCC Pioneer Preference reviews and am familiar with the requirements for granting such requests.

I have reviewed DSBC's FCC filing of 13 September 1996 including Mr. Barmat's Statement of 12 September, the CD Radio response including Mr. Briskman's Statement, and CD Radio's prior FCC filings for Pioneer's Preference.

- 2. The technical assertions made in Mr. Briskman's Statement are correct. We note also that Mr. Barmat states that the use of the diversity in the satellite transmission is not a new concept because it has long been used in terrestrial microwave radio and indeed is used with satellites in the GPS system. Both these analogies are incorrect. Terrestrial microwave radio is to fixed terminals and uses multiple antennas at each location. That is conspicuously different from a mobile terminal using multiple satellites. GPS does not use space diversity at all for overcoming multipath propagation. The purpose of using more satellites in GPS is not related to multipath phenomena, but rather to computational precision. The geometry needs two satellites to make the computation assuming a known altitude, and further satellites to calculate altitude and correct clock error.
- 3. We finally note that, from our investigation, the "pioneering" of CD Radio is contained in the total technical service proposal which provided multiple channels of radio broadcast to automobiles continuously, and across the entire United States. Anyone who has ever had the experience of trying to follow a world series game in an automobile, while driving on the interstate highways, knows it is just about impossible today. One simply doesn't know what channel anything is on from one region to another. The CD Radio plan with identical channels and continuous radio programs from coast to coast was a brand new idea for a brand new service. CD Radio elaborated on this idea with a technically innovative design. Nothing of the kind existed before nor did anything even close to it exist. By way of analogy, we point out that the pioneers who developed the Western United States from the Appalachian Mountains to the Pacific starting in the early 19th century used existing technology. They had not invented wagons, nor muskets, nor any of the other accoutrements of pioneering. Would anyone gainsay their status as pioneers?

In summary, my review and analysis of the Pioneer's Preference material from a technical standpoint supports CD Radio's request for a Pioneer's Preference. The essential of pioneering is not only technological improvement, but doing something new and innovative. CD Radio certainly has.

Wilbur Pritchard

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President

W.L. Pritchard & Co., Inc.

WILBUR L. PRITCHARD

President

Dr. Pritchard is President of W.L. Pritchard & Co., Inc., a consulting engineering firm, doing technical and economic studies in telecommunications and specializing in satellite communications.

He was formerly Chairman of the Board and CEO of SSE Telecom, Inc., a group of related satellite telecommunications companies founded by him which includes Satellite Systems Engineering, Inc., and SSE Technologies, Inc. Dr. Pritchard founded Satellite Systems Engineering, Inc., in 1974 to provide direction and systems engineering in satellite communications to governments and private companies.

He is also Professorial Lecturer at George Washington University and Adjunct Professor of Electrical Engineering at the Polytechnic University of New York where he teaches courses in satellite communication.

Dr. Pritchard has been identified with communications satellites since 1962 when he moved from the Raytheon Company to the Aerospace Corporation to direct the team that produced DSCS-1, the first operational military satellite system; the US TACSAT satellite system; and the UK Skynet System.

In 1967, Dr. Pritchard came to Communications Satellite Corporation as its first Director of COMSAT Labs and later as Vice President of the corporation. While at COMSAT, he also served as U.S. Delegate to the Technical Subcommittee of Intelsat for four years, representing COMSAT both in its capacity as U.S. signatory to the Intelsat agreement and as executive manager of the Intelsat organization.

He was an early innovator in the field of direct broadcast satellites, both video and audio, founded two companies in that field, and has been a consultant to several others.

Dr. Pritchard has been a member of a number of study groups and task forces: The National Academy of Sciences Panel to Study Broadcast Satellites (1968, chairman); the Snowmass Study (1974, expert on broadcast satellites as a member of the National Academy of Engineering's Space Applications Board); NASA's Space Applications Advisory Committee (1984); NASA's Space and Earth Sciences Advisory Committee Task Force on the Scientific Uses of the Space Station (1984-1988); National Academy of Engineering's task force for the Voice of America (1986-1989).

In recognition of his contributions in the field of communications satellites, Dr. Pritchard has been honored as Member of the National Academy of Engineering, Fellow of the Institute of Electrical and Electronics Engineers (IEEE), and Fellow of the American Institute of Aeronautics and Astronautics (AIAA). He has received the US Air Force Systems Command Award for Outstanding Achievement for contributions to the Initial Defense Communications Satellite System; AIAA Aerospace Communications Award for contributions to technical management and leadership in military communications satellites and for the direction of COMSAT Labs; and the Lloyd V. Berkner Space Utilization Award of the American Astronautical Society, Inc., for contributions to the commercial utilization of space technology.

Dr. Pritchard was educated at the City College of New York where he received a B.E.E. degree in Electrical Engineering in 1943, and at Massachusetts Institute of Technology where he pursued graduate studies from 1948-1952. In 1993 he was awarded an honorary Sc.D. by the City College of New York. He is a licensed professional engineer (PE) in Maryland and Massachusetts.

TO WHOM IT MAY CONCERN

As part of a due diligence program, I was retained in 1993 by First Marathon Technologies of Bellevue, Washington as a technical consultant to assist them in an engineering evaluation of CD Radio's satellite system technology.

The evaluation included the physical measurement of the signal power received by the demonstration automobile from the rooftop satellite emulators to determine if the received powers were equivalent to those which would be received from the proposed CD Radio geosynchronous satellites.

I personally performed measurements of the received signal powers from the satellite emulators in the demonstration automobile during early 1994 and found them to be equivalent to those which would be received from the subject satellites.

My professional biography is attached.

Paul Pridate

Paul Budak

10/2/96

Paul Budak Director, Strategic Engineering

Paul Budak is responsible for Stellar One's technology strategy development including embedded systems technology. He is also involved with the management of SOC's intellectual property assets.

Budak brings over thirteen years of experience in all phases of electronic systems and component development to the Company. He began his professional career with Boeing Aerospace Company and Boeing Electronics Company, and has held engineering and management positions at Renaissance GRX, Inc., NeoPath, Inc., and Starwave Corporation.

Budak holds bachelor of science and master of science degrees in electrical engineering from the University of Washington.